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(54) APPARATUS AND METHOD FOR APPLYING DISCRETE PARTS ONTO A MOVING WEB

VORRICHTUNG UND VERFAHREN, UM VONEINANDER GETRENNTE TEILE AUF EINER SICH BEWEGENDEN LAGE ANZUBRINGEN

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(73) Proprietor: Kimberly-Clark Worldwide, Inc.
Neenah, WI 54956 (US)

(72) Inventors:
- BOOTHE, Judson, Lamar
Columbus, Georgia 31909 (US)
- KRAUTKRAMER, Peter, James
Greenville, WI 54942 (US)
- KRUEGER, Gary, Alan
Neenah, WI 54956 (US)

(74) Representative:
Diehl, Hermann, Dr. Dipl.-Phys. et al
DIEHL, GLÄSER, HILTL & PARTNER
Patentanwälte
Augustenstrasse 46
80333 München (DE)

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Description

Background of the Invention

Field of the Invention

[0001] The present invention relates to an apparatus and method for receiving discrete parts traveling at a speed and applying the parts to a web traveling at a different speed. The invention more particularly concerns an apparatus and method for receiving discrete elongated elastic parts of a continuously moving web of elongated elastic material traveling at a certain speed and applying the discrete elongated elastic parts onto a product web of interconnected disposable absorbent articles traveling at a different speed

Description of the Related Art

[0002] Articles, such as disposable diapers, generally have been manufactured by a process where discrete parts or components of different materials, such as leg elastic, waist elastic, tapes, and other fasteners such as hook and loop materials or snaps, have been applied to a continuously moving product web of interconnected articles. Often, the speed at which the parts are fed into the process is not the same as the speed of the product web itself. Thus, the speed of the parts must be changed to match the speed of the product web to properly apply the parts without adversely affecting the process or the finished articles.

[0003] Several different conventional methods for changing the speed of a part or component of material such that it can be applied to a continuously moving web have been known to those skilled in the art. For example, one method has been known as the slip gap or slip cut method. A web of material, which is traveling at a slower speed than the moving web, is fed into a knife and anvil roll having a surface speed equal to the speed of the moving web. As the material is cut into discrete parts, vacuum in the anvil roll is activated to draw the parts of material to the surface of the anvil roll. The anvil roll then carries the parts to the moving web where the vacuum is released and the parts are applied to the moving web while both the parts and the moving web are traveling at the same speed.

[0004] Another method has utilized festoons to reduce the speed of the moving web to match the speed of the discrete parts of material to be applied to the web. The moving web is temporarily slowed down to the speed of the parts with the excess portion of the moving web gathering in festoons. The parts of material are then applied to the moving web while both the parts and the web are traveling at the same speed. The festoons are then released allowing the moving web to return to its original speed.

[0005] Another method has utilized a slider-crank mechanism to accomplish the speed change. The slider-crank mechanism utilizes concentrically mounted arms or linkages to receive the discrete parts of material, increase the speed of the parts to match the speed of the moving web and apply the parts to the moving web. The slider-crank mechanism is a special case of a four bar linkage system.

[0006] Finally, another such method to change the speed of a discrete part before it is applied to a moving web has utilized a cam actuated crank-follower mechanism. The cam actuated crank-follower mechanism comprises crank levers that are mounted on a rotatable driving plate. Each crank lever includes a cam follower on one end and a follower lever connected to the other end. The other end of the follower lever is connected to an applicator device which is mounted concentric with the driving plate's center of rotation. The cam follower remains in contact with a fixed cam that is also mounted concentric with the driving plate's center of rotation. As the driving plate rotates, the crank levers pivot as their cam followers follow the cam shape. As the crank levers pivot, the follower levers cause the applicator devices to speed up or slow down. An example of this method is described in U.S. Patent No. 4,610,751 issued September 9, 1986, to Eschler.

[0007] From US-A-3,963,557 a vacuum applicating apparatus for dispensing and applying measured lengths of tape on a moving substrate is known. The apparatus comprises a plurality of rotating applicating segments which are driven by driving wheels. The segments can be disposed so that tape is fed onto the segments from a continuous supply of of tape a slow speed. The tape is severed into discrete lengths and the lengths are applied in spaced relationship to a moving substrate. According to this document, it has however not been known that each said webs are being conveyed at separate speeds.

[0008] Conventional methods, such as those described above, have exhibited several drawbacks. First, as the discrete parts of material are transferred, they are often subjected to a tugging action because the surface speed of the transfer means used to transfer the parts is greater than the speed of the parts. The tugging action may result in an undesirable elongation or tear of the parts. Second, several of the conventional methods provide substantial speed variations but do not provide any periods where the speed remains constant for a fixed duration. Thus, the discrete parts may be adversely affected because the surface speed of the transfer means used to transfer the parts is continuously changing during the receiving and application process. Finally, several of the conventional methods can be very expensive and time consuming to change as the size and speed of the discrete parts and the speed of the moving web change to coincide with various finished product sizes. Consequently, an inexpensive and adaptable apparatus for receiving discrete parts traveling at a speed and applying the parts to a web traveling at a different speed is desirable.

[0009] Moreover, it is desirable that the receiving and applying of the parts occurs while the respective surface speeds are maintained substantially constant for a fixed duration. For example, it is desirable to apply the parts to the substrate web while the parts and substrate web are traveling at substantially the same surface speed. Such a constant speed dwell allows precise control of the length and placement of the part on the substrate web especially if the part is fragile and/or elastic.

Summary of the Invention

[0010] In response to the discussed difficulties and problems encountered in the prior art a new apparatus and method for receiving discrete parts traveling at a speed, changing the speed of the parts to match the speed of a continuously moving substrate web traveling at a different speed and applying the parts to the moving substrate web have been discovered

[0011] In one aspect, the present invention concerns an apparatus for severing a first substrate web traveling at a first speed into discrete parts and applying the discrete parts onto a second substrate web traveling at a second speed. The apparatus includes at least one transfer segment which is configured to rotate about a first axis. The transfer segment includes an outer surface which is configured to receive the discrete parts and apply the discrete parts to the second substrate web. The apparatus also includes a drive ring which is configured to rotate about a second axis which is offset from the first axis of the transfer segment. At least one coupler arm is pivotally connected to the drive ring about a pivot point located radially outward from the second axis. The coupler arm includes a cam end which is configured to follow a predetermined curvilinear path and a crank end which is slidably connected to the transfer segment. A drive mechanism is configured to rotate the drive ring about the second axis. As the drive ring is rotated, the cam end of the coupler arm is guided along the curvilinear path and the crank end of the coupler arm slidably engages the transfer segment thereby pivoting the coupler arm about the pivot point to vary an effective drive radius of the transfer segment and rotate the transfer segment at a variable speed. In use, the transfer segment is configured to maintain a substantially constant first surface speed as the discrete parts are received and a substantially constant second surface speed as the discrete parts are applied to the second substrate web.

[0012] In another aspect, the present invention concerns an apparatus for severing an elongated elastic web traveling at a first speed into discrete elongated elastic parts and applying the elongated elastic parts onto a product web of interconnected disposable absorbent articles traveling at a second speed. The apparatus includes a plurality of transfer segments which are configured to rotate about a common first axis The transfer segments include an outer surface which is configured to receive the elongated elastic parts and apply the elongated elastic parts to the product web. The apparatus also includes a drive ring which is configured to rotate about a second axis which is offset from the first axis of the transfer segments. A plurality of coupler arms are pivotally connected to the drive ring about a respective pivot point which is located radially outward from the second axis. Each of the coupler arms includes a cam end which is configured to follow a predetermined curvilinear path and a crank end which is slidably connected to a respective one of the transfer segments. A drive mechanism is configured to rotate the drive ring about the second axis. As the drive ring is rotated, the cam end of each of the coupler arms is guided along the curvilinear path and the crank end of each of the coupler arms slidably engages the respective transfer segment thereby pivoting the coupler arms about the pivot points and rotating the transfer segments at a variable speed. The offset crank motion of the drive ring and the pivoting of the coupler arms independently varies an effective drive radius of the transfer segments to provide the variable speed. In a particular aspect, the outer surface of the transfer segments may define a surface roughness of at least about 3 micrometers to maintain the elongated elastic parts in an elongated state.

[0013] In yet another aspect, the present invention concerns a method for severing a first substrate web traveling at a first speed into discrete parts and applying the discrete parts onto a second substrate web traveling at a second speed. The method includes the steps of: (a) supplying the first substrate web at the first speed and the second substrate web at the second speed; (b) severing the first substrate web into the discrete parts; (c) rotating at least one transfer segment about a first axis at a variable speed wherein the step of rotating includes the steps of: (i) providing a drive ring which is rotatable about a second axis which is offset from the first axis of the transfer segment; (ii) providing a coupler arm which is pivotally connected to the drive ring about a pivot point located radially outward from the second axis wherein the coupler arm includes a cam end which is configured to follow a predetermined curvilinear path and a crank end which is slidably connected to the transfer segment; and (iii) rotating the drive ring about the second axis thereby guiding the cam end along the curvilinear path and slidably engaging the crank end with the transfer segment to pivot the coupler arm about the pivot point to selectively vary an effective drive radius of the transfer segment and rotate the transfer segment at the variable speed; (d) transferring the discrete parts onto an outer surface of the transfer segment while the transfer segment is rotating at a first surface speed; and (e) applying the discrete parts onto the second substrate web while the transfer segment is rotating at a second surface speed.

[0014] In a particular aspect, the pivoting of the coupler arm maintains the first surface speed of the transfer segment substantially equal to the speed of the first sub-

strate web as the discrete parts are received and maintains the second surface speed of the transfer segment substantially equal to the second speed of the second substrate web as the discrete parts are applied to the second substrate web. In such a configuration, the first surface speed and the second surface speed may be maintained substantially constant for at least 10 degrees of rotation of the transfer segment. The first surface speed and the second surface speed may further define a speed ratio of from about 0.1:1 to about 0.99:1.

[0015] In still another aspect, the present invention concerns a method for severing an elongated elastic web traveling at a first speed into discrete elongated elastic parts and applying the elongated elastic parts in a spaced apart relationship onto a product web of interconnected disposable absorbent articles traveling at a second speed. The method comprises the steps of: (a) supplying the elongated elastic web at the first speed and the product web at the second speed, (b) severing the elongated elastic web into the discrete elongated elastic parts; (c) rotating a plurality of transfer segments about a common first axis at a variable speed wherein said step of rotating includes the steps of: (i) providing a drive ring which is rotatable about a second axis which is offset from the first axis; (ii) providing a plurality of coupler arms each of which is pivotally connected to the drive ring about a respective pivot point which is located radially outward from the second axis wherein each of the coupler arms includes a cam end which is configured to follow a predetermined curvilinear path and a crank end which is slidably connected to a respective one of the transfer segments; and (iii) rotating the drive ring about the second axis thereby guiding said cam end along said curvilinear path and slidably engaging said crank end with said respective transfer segment to pivot each of the coupler arms about the respective pivot points to independently vary an effective drive radius of each of the transfer segments and rotate the transfer segments at the variable speed; (d) transferring each of the discrete elongated elastic parts onto an outer surface of the respective transfer segment while the respective transfer segment is rotating at a first surface speed which is substantially equal to the first speed of the elongated elastic web; and (e) applying each of the elongated elastic parts onto the product web while the respective transfer segment is rotating at a second surface speed which is substantially equal to the second speed of the product web. In a particular aspect, the method includes the step of maintaining the discrete elongated elastic parts at an elongation of at least 150 percent until they are applied to the product web.

[0016] As compared to conventional apparatus and methods, such as the slip gap method described above, for changing the speed of a discrete part such that it can be applied to a continuously moving web, the use of the combination of an eccentrically mounted drive means and a pivotal coupler arm provides the ability to obtain greater changes in speed and to maintain constant speeds for a fixed duration. Thus, the use of the present invention can provide a more precise control of the length and placement of the discrete part onto the moving web.

Brief Description of the Drawings

[0017] The present invention will be more fully understood and further advantages will become apparent when reference is made to the following detailed description of the invention and the accompanying drawings wherein like numerals represent like elements. The drawings are merely representative and are not intended to limit the scope of the appended claims.

> Fig. 1 representatively shows a front elevational view of one example of an apparatus of the present invention;
>
> Fig. 2 representatively shows a partially cut away side elevational view of the apparatus of Fig. 1;
>
> Fig. 3 representatively shows a typical speed profile for the apparatus of Fig. 1; and
>
> Fig. 4 representatively shows a partially cut away side elevational view of another example of an apparatus of the present invention.

Detailed Description of the Invention

[0018] The present invention provides an apparatus and method for receiving discrete parts traveling at a first speed and applying the parts to a substrate web traveling at a second speed The apparatus and method are particularly useful for receiving discrete parts of an elastic material, such as leg or waist elastics, and applying the parts to a product web of interconnected disposable absorbent articles such as, for example, disposable diapers. It is readily apparent, however, that the apparatus and method would be suitable for applying any part to a substrate web.

[0019] Referring now to Figs. 1 and 2, there is representatively shown an aspect of the invention wherein an apparatus generally indicated at 20 receives a first substrate web 22 traveling at a first speed in the direction indicated by the arrow 24 associated therewith, severs the first substrate web 22 into discrete parts 26 and applies the discrete parts 26 to a second substrate web 28 traveling at a second speed in the direction indicated by the arrow 30 associated therewith. The illustrated example of the apparatus 20 comprises three transfer segments 40 which are configured to receive and apply the discrete parts 26. It should be readily understood that the apparatus 20 may include any number of transfer segments depending upon the different web speeds and desired placement and size of the discrete parts 26. Each transfer segment 40 is configured to be rotated by

a drive ring 60 such that the surface speed of each transfer segment 40 is substantially equal to the speed of the first substrate web 22 as the discrete parts 26 are received and substantially equal to the speed of the second substrate web 28 as the discrete parts 26 are applied.

[0020] As representatively illustrated in Figs. 1 and 2, each transfer segment 40 is coaxially supported and rotatably connected to a common idler shaft 42 on a first axis 44. The transfer segments 40 are configured to rotate about the first axis 44 in the direction indicated by the arrow 52 associated therewith. Each transfer segment 40 includes an outer surface 46 and a support member 48 which is rotatably connected to the idler shaft 42 such that each transfer segment 40 can be rotated independently. The radial inner end of the support member 48 of each transfer segment 40 may be rotatably connected to the idler shaft 42 by any technique known to those skilled in the art such as, for example, using conventional bearings. Similarly, the other components of the apparatus 20 of the present invention can be rotatably connected together employing such conventional techniques.

[0021] The outer surface 46 of each transfer segment 40 travels along and defines a common circumferential path that allows the discrete parts 26 to be received and applied to the second substrate web 28. The outer surface 46 is configured to receive at least one discrete part 26 and apply the discrete part 26 to the second substrate web 28 each revolution. For example, if the apparatus 20 of the present invention is being used to apply leg elastics to a continuously moving product web of interconnected disposable diapers, the outer surface 46 of each transfer segment 40 may be configured to receive two elongated elastic segments and apply the elongated segments along the leg opening regions on each diaper. In a particular aspect, the outer surface 46 of each transfer segment 40 may also be configured to rotate the discrete parts 26 before the discrete parts 26 are applied to the second substrate web 28. For example, as representatively illustrated in Fig. 4, the outer surface 46 of each transfer segment 46 may be connected to a turning mechanism 110 which is configured to rotate the discrete parts before being applied. Such a configuration is particularly desirable for applying waist elastics to a continuously moving web of interconnected disposable diapers.

[0022] In a particular aspect, the outer surface 46 of each transfer segment 40 may be textured to define a surface roughness which assists in gripping and maintaining the discrete parts 26 on the outer surface 46. Such a configuration is particularly desirable when the discrete parts 26 are elongated elastic segments. As used herein, the term "surface roughness" is the surface roughness of a material as determined by conventional methods known to those skilled in the art. One such method utilizes a profilometer to detect the surface roughness. The stylus of the profilometer is drawn across the textured surface a distance of 1.27 centimeters. The profilometer measures the number of peaks and valleys on the surface as well as the magnitude of each. The profilometer automatically calculates the surface roughness as a Roughness Average (R_a) which is the arithmetic average of the measured profile height deviations taken within the sampling length and measured from the graphical centerline. The outer surface 46 of each transfer segment 40 may define a surface roughness of at least about 3 micrometers, desirably at least about 10 micrometers and more desirably at least about 15 micrometers. For example, the outer surface 46 may have a surface roughness of from about 5 to about 50 micrometers and desirably from about 10 to about 20 micrometers. To achieve the surface roughness, the outer surface 46 of each transfer segment may also include a coating such as a plasma coating as are known to those skilled in the art. In a particular aspect wherein the discrete parts 46 being received and applied by the transfer segment 40 are elongated elastic parts, it is desirable that the outer surface 46 have a plasma coating which defines a surface roughness of at least about 5 micrometers.

[0023] To assist in maintaining the discrete parts 26 on the outer surface 46 of each transfer segment 40, the outer surface 46 may also include a plurality of holes therein through which a relatively low pressure or vacuum can be drawn. The use of such vacuum is particularly desirable when the apparatus 20 of the present invention is used to receive and apply discrete parts 26 which are elongated elastic parts such as leg elastics for application on disposable diapers. The number and pattern of the holes through which the vacuum may be drawn may vary depending upon the size of the transfer segment 40, the shape and size of the discrete parts 26 and the desired location of the discrete parts 26 on the transfer segment 40. If vacuum is desired, typically only a relatively small amount of vacuum is needed to assist the rough outer surface 46 of the transfer segments 40 to maintain the discrete parts 26 on the outer surface 46. For example, typically no more than about 20 inches of water and desirably only from about 0 to about 10 inches of water are required to assist the rough outer surface 46. Applicants have discovered that, when compared to conventional methods which use relatively high levels of vacuum to grip the parts, the combination of the rough outer surface 46 and the relatively low level of vacuum of the apparatus of the present invention provide improved control and placement of the discrete parts 26 on the substrate web 28 at a relatively lower cost.

[0024] If vacuum is desired, the vacuum may be drawn through the holes in the outer surface 46 by one or more sources of vacuum using conventional techniques for drawing a vacuum as are known to those skilled in the art The vacuum to each transfer segment 40 may also be controlled such that a vacuum is only being drawn from the outer surface 46 of each transfer

segment for the period of it's rotation when the discrete parts 26 are located on the outer surface 46. For example, the vacuum may be activated just prior to the discrete parts 26 being received and inactivated immediately after the discrete parts 26 are applied to the substrate web 28.

[0025] The dimensions of the transfer segments 40 will vary depending upon the desired number of transfer segments 40 and the size and shape of the discrete parts 26 being transferred. For example, when the apparatus 20 includes three transfer segments 40 as representatively illustrated in Figs. 1 and 2, each transfer segment 40 may have an outer, peripheral arc length spanning of from about 20 degrees to about 120 degrees, an outer radius of from about 5 centimeters to about 50 centimeters, and a width of from about 5 centimeters to about 40 centimeters.

[0026] The apparatus 20, as representatively shown in Figs. 1 and 2, further comprises a drive ring 60 which is configured to rotate each transfer segment 40 at a variable speed. The inner radial end of the drive ring 60 is rotatably connected to a fixed shaft 62 on a second axis 64. The drive ring 60 is configured to be rotated at a constant speed about the second axis 64 by a driving means 68 in the direction indicated by the arrow 58 associated therewith. The driving means 68 may include a motor operatively connected through suitable gearing and drive belts to the drive ring 60. Thus, in use, the motor rotates the drive ring, which, in turn, rotates the transfer segments 40 at the desired variable speed.

[0027] To provide the desired variable speed of each transfer segment 40, the second axis 64 of the drive ring 60 is offset from the first axis 44 of the transfer segments 40 by an offset distance 66. The offset distance 66 between the first axis 44 and the second axis 64 may be any distance which provides the desired variations in the speed of the outer surface 46 of each transfer segment 40. For example, the offset distance 66 may be at least about 0.1 centimeters, desirably from about 0,1 to about 7.5 centimeters and more desirably from about 2.5 to about 5.0 centimeters.

[0028] The apparatus 20 further comprises at least one coupler arm 70 which is pivotally connected to the drive ring 60 about a pivot point 72. The apparatus 20 typically includes one coupler arm 70 for each transfer segment 40. Accordingly, in the apparatus 20 representatively illustrated in Figs. 1 and 2 which includes three transfer segments 40, three coupler arms 70 independently connect the drive ring 60 to each respective transfer segment 40. The coupler arms 70 are pivotally connected to the drive ring 60 about pivot points 72 which are selectively located to provide the desired speeds for the transfer segments 40. In a particular aspect, the pivot points 72 for the coupler arms 70 are located the same distance radially outward from the axis 64 of the drive ring 60. In such a configuration, the pivot points 72 rotate at a constant speed along a common circumferential path as the drive ring 60 is rotated at a constant speed. The coupler arms 70 may be pivotally connected to the drive ring 60 by conventional means known to those skilled in the art. For example, a bearing which is commercially available from SKF Industries, Inc., a business having offices located in King of Prussia, Pennsylvania, may be used to pivotally connect the coupler arms 70 to the drive ring 60 at the pivot points 72.

[0029] Each coupler arm 70, as representatively illustrated in Figs. 1 and 2, includes a cam end 76 and a crank end 78 which extend radially outward from the pivot point 72, The cam end 76 and crank end 78 are designed to remain at a fixed angle relative to each other. For example, a first line extending through the pivot point 72 and the cam end 76 and a second line extending through the pivot point 72 and the crank end 78 may define an angle of from about 30 to about 180 degrees and desirably from about 60 to about 120 degrees to provide the desired variable speed The cam end 76 of each coupler arm 70 is configured to follow a predetermined curvilinear path and the crank end 78 of each coupler arm 70 is slidably connected to a respective transfer segment 40. As the drive ring 60 is rotated, the cam end 76 of each coupler arm 70 is guided along the curvilinear path and the crank end 78 of each coupler arm slidably engages the respective transfer segment 40 thereby pivoting the coupler arm 70 about the pivot point 72. The pivoting of the coupler arm 70 and the offset crank motion of the drive ring 60 vary the effective drive radius 50 of each transfer segment 40 and rotate each transfer segment 40 at a variable speed. In a particular aspect, each coupler arm 70 is configured to pivot at least about 5 degrees and desirably from about 20 to about 60 degrees as the drive ring 60 is rotated to provide the desired changes in the effective drive radius 50 and rotation of each transfer segment 40.

[0030] The cam end 76 of each coupler arm 70 may be guided along the curvilinear path by any means known to those skilled in the art. In a particular aspect, as illustrated in Figs. 1 and 2, the cam end 76 may include a cam follower 80 which is connected to the radially outward end of the cam end 76 and configured to follow the profile of a cam mechanism 82. In such a configuration, the profile of the cam mechanism 82 can be readily changed to change the desired speed output. Suitable cam followers and cam mechanisms are known to those skilled in the art. For example, the cam follower 80 may be one commercially available from INA, a business having offices located in Fort Mills, North Carolina, under the trade designation NUKR 35. A suitable cam mechanism 82 may be manufactured with any desired profile by methods known to those skilled in the art.

[0031] The crank end 78 of each coupler arm 70 may be slidably connected to the respective transfer segment 40 by any means known to those skilled in the art. In a particular aspect as representatively illustrated in Figs. 1 and 2, an inwardly grooved slide member 84 may be pivotally connected to the radially outward end of the crank end 78 of each coupler arm 70. Each slide mem-

ber 84 is configured to slide along a rail member 86 which is connected to the support member 48 of the respective transfer segment 40. Each rail member 86 projects outwardly from the transfer segment 40 and may be positioned on the transfer segment 40 in any alignment which provides the desired speeds of the transfer segment 40. Suitable complementary slides and rails are known to those skilled in the art. For example, the slide member 84 and rail member 86 combination may be one commercially available from Star Linear Systems, Inc., a business having offices located in Charlotte, North Carolina, under the trade designation Ball Rail System -1651-15. Alternatively, the crank end 78 of each coupler arm 70 may include a groove therein which is configured to slidably engage a cam follower located on the respective transfer segments 40.

[0032] The apparatus 20, as representatively illustrated in Figs 1 and 2, may further include a knife roll 90 to sever the continuously moving first substrate web 22 into the discrete parts 26 that are fed onto each transfer segment 40. The knife roll 90 may be any mechanism known to those skilled in the art that can sever a web of material into discrete segments such as, for example, a rotary cutter. As representatively illustrated in Fig. 1, the knife roll 90 may be connected to and configured to rotate about a shaft 92. The knife roll 90 may further include a plurality of cutting edges 94 which are configured to sever the first substrate web 22 into the discrete parts 26.

[0033] As representatively illustrated in Fig. 4, the apparatus 20 may further include a turning mechanism 110 for rotating the discrete parts 26 before they are applied to the second substrate web 28. Any mechanism which provides the desired rotation of the parts 26 can be used. For example, one suitable mechanism is a barrel cam as are well known to those skilled in the art. Thus, in use, the discrete parts 26 may be received by the transfer segment 40 while oriented in one direction and, subsequently, be rotated by the turning mechanism 110 in the direction indicated by the arrow 112 associated therewith before being applied to the second substrate web 28. The turning mechanism 110 can be configured to rotate the discrete parts 26 any amount before they are applied. For example, the turning mechanism 110 may be configured to rotate the parts 26 from about 1 to about 180 degrees and desirably from about 1 to about 90 degrees before they are applied depending upon the desired orientation of the parts 26 on the second substrate web 28. Such a turning mechanism 110 is particularly useful when applying waist elastics to a product web of interconnected disposable absorbent articles

[0034] It will be apparent that the continuously moving substrate web 22, in certain aspects of the invention, may be omitted and the discrete parts 26 may be placed directly upon each transfer segment 40. In addition, it will be apparent that the discrete parts 26 may be adhered to the second substrate web 28 by means of an adhesive applied in a selected pattern to the surface of the discrete parts 26, or by any other suitable means for adhering the discrete parts 26 to the substrate web 28.

[0035] The use of the combination of the offset drive ring 60 and pivoting coupler arm 70 to drive the transfer segments 40 in the apparatus 20, as representatively illustrated in the various aspects of the invention described above, provides an inexpensive and adaptable method for severing a first substrate web 22 traveling at a speed into discrete parts 26 and applying the discrete parts 26 to a substrate web 28 traveling at a different speed. The design of the drive ring 60 and coupler arm 70 can be analytically determined to obtain the desired output function which can include variable angular velocities with fixed speed dwells. For example, the speed profile of an example of an apparatus 20 according to the different aspects of the present invention is representatively illustrated in Fig. 3. As illustrated, the transfer segments 40 of the apparatus 20 of the present invention can be configured to rotate through a period of low speed dwell 100, acceleration 102, high speed dwell 104 and deceleration 106 in each revolution.

[0036] As the offset drive ring 60 rotates at a constant speed, each coupler arm 70 pivots about the pivot points 72 as the cam end 76 of the coupler arm 70 is guided along the profile of the cam 82 and the crank end of the coupler arm 70 slidably engages the respective transfer segment 40. As a result, the effective drive radius 50 for each transfer segment 40 is varied thereby varying the surface speed of each transfer segment 40 independently. The periods of acceleration 102 and deceleration 106 of each transfer segment 40 are provided by the offset crank motion which results from the axis 64 of the drive ring 60 being offset from the axis 44 of the transfer segments 40. Whereas, the periods of low speed dwell 100 and high speed dwell 104 are provided by the pivoting action of each coupler arm 70 about the pivot points 72 as the drive ring 60 is rotated. As such, the combination of the offset drive ring 60 and the pivoting coupler arm 70 of the apparatus 20 of the present invention can provide both the desired changes in speed and the desired periods of constant speed to effectively receive and apply the discrete parts 26 onto the substrate web 28 in the desired spaced apart locations.

[0037] As compared to conventional methods, such as the slip gap method described above, for changing the speed of a discrete part such that it can be applied to a continuously moving web, the use of the combination of the offset drive ring 60 and the pivoting coupler arm 70 of the present invention provides the ability to obtain greater changes in speed and to maintain constant speeds for a fixed duration. The fixed speed dwell achieved by using the apparatus of the present invention can be accurately and inexpensively designed to precisely control the length and placement of the discrete parts 26 on the substrate web 28. For example, in the various aspects of the invention, the drive ring 60 and coupler arm 70 are analytically designed such that each transfer segment 40 receives the discrete parts 26

while maintaining a constant surface speed substantially equal to the speed of the first substrate web 22 and applies the discrete parts 26 to the second substrate web 28 while maintaining a constant surface speed which is substantially equal to the speed of the second substrate web 28.

[0038] In a particular aspect, the surface speed of each transfer segment 40 is maintained substantially constant as the discrete parts 26 are received or applied for at least about 10 degrees of rotation and desirably at least about 20 degrees of rotation of the transfer segment. For example, the surface speed of each transfer segment-may be maintained substantially constant as the parts are received or applied for from about 5 to about 120 degrees of rotation, desirably from about 15 to about 90 degrees of rotation, and more desirably from about 45 to about 60 degrees of rotation of the respective transfer segment 40. In addition, the surface speed increase or decrease of the transfer segment 40 as it moves from receiving the discrete parts 26 to applying the discrete parts 26 and back again defines a speed ratio of from about 0.1:1 to about 0.99:1, desirably from about 0.38:1 to about 0.75:1, and more desirably from about 0.4:1 to about 0.6:1. The term "speed ratio", as used herein, defines the ratio of the surface speed of the transfer segment 40 at the low speed dwell 100 to the surface speed of the transfer segment 40 at the high speed dwell 104 as representatively illustrated in Fig. 3.

[0039] The apparatus and method of the present invention may be used in the manufacture of articles such as diapers, training pants, and adult incontinence products, among other uses. In particular, apparatus and method may be used to apply discrete parts or components, such as, for example, waist elastic, leg elastic, tapes, snaps, and hook and loop materials to the diaper or incontinence product. Articles such as diapers and incontinence products are described, for example, in U. S. Patent Nos. 4,704,116 issued November 3, 1987, to Enloe; No. 4,798,603 issued January 17, 1989, to Meyer et al.; No. 4,710,187 issued December 1, 1987, to Boland et al.; No. 4,770,656 issued September 13, 1988, to Proxmire et al.; and No. 4,762,521 issued August 9, 1988 to Roessler et al.; the disclosures of which are incorporated by reference.

[0040] In a particular aspect, the apparatus 20 of the present invention may be used to apply elongated elastic parts to the leg opening regions on a product web of interconnected disposable diapers. For example, a continuously moving web of elongated elastic material 22 may be fed into the knife roll 90. The web of elastic material may be elongated at least about 150 percent and desirably from about 150 to about 400 percent before being severed. The knife roll 90 severs the web of elongated elastic material 22 into discrete elongated elastic parts 26 that are fed onto each transfer segment 40. The elongated elastic parts 26 are held onto the outer surface 46 of each transfer segment 40 as it rotates in the elongated state by the surface roughness of the outer surface 46 In a particular aspect, the elongated elastic parts 26 are maintained at an elongation of at least about 125 percent, desirably at least about 150 percent, and more desirably from about 150 to about 400 percent until they are applied to the product web. In addition, a relatively low level of vacuum may also be drawn through holes in the outer surface 46 to assist the surface roughness in maintaining the elongated elastic parts 26 in the elongated state.

[0041] The combination of the offset drive ring 60 and the pivoting coupler arm 70 are rotated by the drive means 68 which, in turn, rotates each transfer segment 40 at the desired variable speed with fixed speed dwells. As each transfer segment 40 is rotated, the outer surface 46 of each transfer segment 40 maintains a substantially constant speed as the discrete elongated elastic parts 26 are received and applied. In particular, each transfer segment 40 receives the elongated elastic parts 26 while maintaining a constant surface speed substantially equal to the speed of the web of elongated elastic material 22. The surface speed of each transfer segment 40 then changes to a second constant surface speed such that the speed of the discrete elongated elastic parts 26 being transferred is substantially equal to the speed of the continuously moving product web of interconnected diapers as the elongated elastic parts 22 are applied to the leg opening regions on each diaper. The surface speed of each transfer segment 40 is then changed back to substantially equal the speed of the web of elongated elastic material 22 before the next discrete elongated elastic part 26 is received.

[0042] The discrete elongated elastic parts 22 being applied to the web of interconnected diapers 28 may be made of any suitable material having elastic or stretchable properties. Examples of such materials include films or layers of natural rubber, synthetic rubber, or thermoplastic elastomeric polymers, and can be panels, or single, or multiple threads or filaments or ribbons thereof. These materials may also be heat-shrinkable or heat-elasticizable. Furthermore, these stretchable materials may be formed with gatherable layers, such as spunbonded polymer materials, as a stretch-bonded laminate. For example, a suitable stretch-bonded laminate comprise two gatherable layers of 0.4 ounce per square yard of spunbond polypropylene having therebetween a layer of meltblown elastic material such as a Kraton elastic in either layer form or separate threads of material having a basis weight of about 0.5 ounce per square yard. The layer of the elastomeric is stretched, the two layers of polypropylene then joined to the elastomeric layer, and upon relaxing the layers, the polypropylene layers gather. The materials may be breathable or nonbreathable.

[0043] Although the above representative example concerns the application of leg elastic to a diaper, it should be readily apparent to those of ordinary skill in the art that the present invention may be utilized in any circumstance requiring speed variations and constant

speed dwells when transferring parts onto a moving web.

[0044] While the invention has been described in detail with respect to specific aspects thereof, it will be appreciated that those skilled in the art, upon attaining an understanding of the foregoing, may readily conceive of alterations to, variations of, and equivalents to these aspects. Accordingly, the scope of the present invention should be assessed as that of the appended claims and any equivalents thereto.

Claims

1. An apparatus (20) for severing a first substrate (22) traveling at a first speed into discrete parts (26) and applying said discrete parts (26) onto a second substrate (28) traveling at a second speed, said apparatus comprising:

   a) at least one transfer segment (40) which is configured to rotate about a first axis (44) and which includes an outer surface (46) which is configured to receive said discrete parts (26) and apply said discrete parts (26) to said second substrate (28);

   b) a drive ring (60) which is configured to rotate about a second axis (64) which is offset from said first axis (44) of said transfer segment (40);

   c) a drive means for rotating said drive ring (60) about said second axis (64);

   characterized in that
   said first substrate (22) and said second substrate (28) are webs, and that
   said apparatus (20) further comprises at least one coupler arm (70) which is pivotally connected to said drive ring (60) about a pivot point (72) located radially outward from said second axis (64) wherein said coupler arm (70) includes a cam end (76) which is configured to follow a predetermined curvilinear path and a crank end (78) which is slidably connected to said transfer segment (40);
   and wherein, as said drive ring (60) is rotated, said cam end (76) of said coupler arm (70) is guided along said curvilinear path and said crank end (78) of said coupler arm (70) slidably engages said transfer segment (40) thereby pivoting said coupler arm (70) about said pivot point (72) to vary an effective drive radius of said transfer segment (40) and rotate said transfer segment (40) at a variable speed.

2. The apparatus (20) of claim 1 wherein said outer surface (46) of said transfer segment (40) defines a surface roughness of at least 3 micrometers.

3. The apparatus (20) of claim 1 wherein said outer surface (46) of said transfer segment (40) includes a plasma coating thereon.

4. The apparatus (20) of claim 3 wherein said outer surface (46) of said transfer segment (40) defines a surface roughness of at least 3 micrometers.

5. The apparatus (20) of claim 2 wherein said outer surface (46) defines a plurality of openings through which a vacuum can be drawn.

6. The apparatus (20) of claim 1 wherein said second axis (64) of said drive ring (60) is offset from said first axis (44) of said transfer segment (40) by a distance of at least 0.1 centimeters.

7. The apparatus (20) of claim 1 wherein said crank end (78) of said coupler arm (70) includes a groove therein which is configured to slidably engage a cam follower (80) located on said transfer segment (40).

8. The apparatus (20) of claim 1 wherein said crank end (78) of said coupler arm (70) includes a slide member (84) which is pivotally connected to said crank end (78) and configured to slidably engage a rail member (86) which is located on said transfer segment (40).

9. The apparatus (20) of claim 1 wherein a first line extending through said pivot point (72) and said cam end (76) of said coupler arm (70) and a second line extending through said pivot point (72) and said crank end (78) of said coupler arm (70) define a fixed angle of from 30 to 180 degrees.

10. The apparatus (20) of claim 1 wherein said transfer segment (40) is configured to maintain a substantially constant first surface speed as said discrete parts (26) are received and a substantially constant second surface speed as said discrete parts (26) are applied to said second substrate web (28).

11. The apparatus (20) of claim 10 wherein said transfer segment (40) is configured to maintain each of said substantially constant first surface speed and said substantially constant second surface speed for at least 10 degrees of rotation of said transfer segment (40).

12. The apparatus (20) of claim 10 wherein said first surface speed of said transfer segment (40) is substantially equal to said first speed of said first substrate web (22) and said second surface speed of said transfer segment (40) is substantially equal to said second speed of said second substrate web (28).

13. The apparatus (20) of claim 1 and further comprising a turning means (110) which is connected to said transfer segment (40) for rotating said outer surface (46) of said transfer segment (40) to rotate said discrete parts (26) before said parts (26) are applied to said second substrate web (28).

14. The apparatus (20) of any of the preceding claims wherein the first substrate web (22) is an elongated elastic web and is severed into discrete elongated elastic parts (26) and wherein the second substrate web (28) is a product web of interconnected disposable absorbent articles wherein in part

a) a plurality of transfer segments (40) are configured to rotate about a common first axis (44)

wherein in part c) a plurality of coupler arms (70), each of which is pivotally connected to said drive ring (60) about a respective pivot point (72) are provided

whereby said coupler arms (70) are pivoted about said pivot points (72) to independently vary an effective drive radius of said transfer segments (40) and rotate said transfer segments (40) at a variable speed.

15. The apparatus (20) of claim 14 wherein said outer surface (46) of said transfer segments (40) defines a surface roughness of at least 3 micrometers which is configured to maintain said elongated elastic parts (26) in an elongated state.

16. A method for severing a first substrate (22) traveling at a first speed into discrete parts (26) and applying said discrete parts (26) onto a second substrate (28) traveling at a second speed, said method comprising the steps of:

a) supplying said first substrate (22) at said first speed and said second substrate (28) at said second speed;

b) severing said first substrate (22) into said discrete parts (26);

c) rotating at least one transfer segment (40) about a first axis (44) at a variable speed; wherein said step of rotating includes the steps of:

d) providing a drive ring (60) which is rotatable about a second axis (64) which is offset from said first axis (44), and rotating said drive ring (60) about said second axis (64);

e) transferring said discrete parts (26) onto an outer surface (46) of said transfer segment (40) while said transfer segment (40) is rotating at a first surface speed; and

f) applying said discrete parts (26) onto said second substrate (28) while said transfer segment (40) is rotating at a second surface speed;

characterized in that

said first substrate (22) and said second substrate (28) are webs, and that

a coupler arm (70) is provided which is pivotally connected to said drive ring (60) about a pivot point (72) located radially outward from said second axis (64) wherein said coupler arm (70) includes a cam end (76) which is configured to follow a predetermined curvilinear path and a crank end (78) which is slidably connected to said transfer segment (40); and

that by rotating said drive ring (60) about said second axis (64) said cam end (76) is guided along said curvilinear path and said crank end (78) is slidably engaged with said transfer segment (40) to pivot said coupler arm (70) about said pivot point (72) to selectively vary an effective drive radius of said transfer segment (40) and rotate said transfer segment (40) at said variable speed.

17. The method of claim 16 wherein said first surface speed of said transfer segments (40) is substantially equal to said first speed of said first substrate web (22) and said second surface speed of said transfer segments (40) is substantially equal to said second speed of said second substrate web (28).

18. The method of claim 16 wherein said pivoting of said coupler arm (70) maintains said first surface speed of said transfer segment (40) substantially constant as said discrete parts (26) are received and maintains said second surface speed of said transfer segments (40) substantially constant as said discrete parts (26) are applied to said second substrate web (28).

19. The method of claim 18 wherein said first surface speed and said second surface speed are maintained substantially constant for at least 10 degrees of rotation of said transfer segment (40).

20. The method of claim 16 wherein said first surface speed of said transfer segment (40) is less than said second speed of said transfer segment (40) such that said discrete parts (26) are applied to said second substrate web (28) in a spaced apart relationship.

21. The method of claim 20 wherein said first surface speed and said second surface speed define a speed ratio of from 0.1:1 to 0.99:1.

22. The method of claim 16 wherein said second axis (64) of said drive ring (60) is offset from said first axis (44) of said transfer segment (40) by a distance of at least 0.1 centimeters.

23. The method of claim 16 wherein said crank end (78) of said coupler arm (70) includes a groove therein which slidably engages a cam follower (80) located on said transfer segment (40) as said drive ring (60) is rotated.

24. The method of claim 16 wherein said crank end (78) of said coupler arm (70) includes a slide member which pivots about said crank end (78) and slidably engages a rail member (86) located on said transfer segment (40) as said drive ring (60) is rotated.

25. The method of claim 16 wherein said step of rotating said drive ring (60) pivots said coupler arm (70) about said pivot point (72) at least 5 degrees.

26. The method of claim 16 and further comprising rotating said outer surface (46) of said transfer segment (40) to rotate said discrete parts (26) before said parts (26) are applied to said second substrate web (28).

27. The method of claim 26 wherein said discrete parts (26) are rotated from 1 to 90 degrees before being applied to said second substrate web (28).

28. The method of any of claims 16 to 27 wherein said first substrate web (22) is an elongated elastic web and is severed into discrete elongated elastic parts (26) and wherein said elongated elastic parts (26) are applied in a spaced apart relationship onto the second substrate web (28), wherein the second substrate web (28) is a product web of interconnected disposable absorbent articles wherein in step

c) a plurality of transfer segments (40) are rotated about a common first axis (44); wherein in step

ii) a plurality of coupler arms (70) are provided each of which is pivotally connected to said drive ring (60) about a respective pivot point (72)
whereby each of said coupler arms (70) are pivoted about said respective pivot points (72) to independently vary an effective drive radius of each of said transfer segments (40) and rotate said transfer segments (40) at said variable speed; wherein in step

d) each of said discrete elongated elastic parts (26) are transferred onto an outer surface (46) of said respective transfer segment (40) while said respective transfer segment (40) is rotating at a first surface speed which is substantially equal to said first speed of said elongated elastic web; and wherein in step

e) said second surface speed is substantially equal to said second speed of said product web (28).

29. The method of claim 28 and further comprising the step of elongating said elastic web at least 150 percent.

30. The method of claim 28 further including the step of maintaining said discrete elongated elastic parts (26) at an elongation of at least 125 percent until said elongated elastic parts (26) are applied to said product web (28).

31. The method of claim 30 wherein said step of maintaining said discrete elongated elastic parts (26) at said elongation further includes the step of selecting said outer surface (46) of said transfer segments (40) to define a surface roughness of at least 3 micrometers.

32. The method of claim 31 wherein said step of maintaining said discrete elongated elastic parts (26) at said elongation further includes the step of drawing a vacuum through a plurality of openings defined in said outer surface (46) of each of said transfer segments (40).

33. The method of claim 28 and further comprising rotating said outer surface (46) of said transfer segment (40) to rotate said discrete elongated elastic parts (26) before said parts (26) are applied to said product web (28).

34. The method of claim 33 wherein said discrete elongated elastic parts (26) are rotated from 1 to 90 degrees before being applied to said product web (28).

Patentansprüche

1. Vorrichtung (20) zum Durchtrennen eines ersten Substrats (22), welches sich mit einer ersten Geschwindigkeit bewegt, in diskrete Teile (26) und Anbringen der diskreten Teile (26) auf einem zweiten Substrat (28), welches sich mit einer zweiten Geschwindigkeit bewegt, wobei die Vorrichtung umfasst:

a) wenigstens ein Übertragungssegment (40), welches zum Rotieren um eine erste Achse (44) ausgebildet ist und welches eine äußere

Oberfläche (46) umfasst, welche zum Empfangen der diskreten Teile (26) und zum Anbringen der diskreten Teile (26) auf dem zweiten Substrat (28) ausgebildet ist;

b) einen Antriebsring (60), welcher zum Rotieren um eine zweite Achse (64) ausgebildet ist, welche zu der ersten Achse (44) des Übertragungssegments (40) versetzt ist;

c) Antriebsmittel zum Rotieren des Antriebsrings (60) um die zweite Achse (64);

dadurch gekennzeichnet, dass
das erste Substrat (22) und das zweite Substrat (28) Bahnen sind, und dadurch, dass
die Vorrichtung (20) ferner wenigstens einen Koppelarm (70) aufweist, der schwenkbar mit dem Antriebsring (60) um einen Schwenkpunkt (72) verbunden ist, der radial außerhalb der zweiten Achse (64) angeordnet ist, wobei der Koppelarm (70) ein Nockenende (76) umfasst, welches ausgebildet ist einem vorbestimmten kurvenlinigen Weg zu folgen, und ein Kurbelende (78), welches gleitend mit dem Übertragungssegment (40) verbunden ist;
und wobei, wenn der Antriebsring (60) rotiert wird, das Nockenende (76) des Koppelarms (70) entlang dem kurvenlinigen Weg geführt wird, und wobei das Kurbelende (78) des Koppelarms (70) gleitend in das Übertragungssegment (40) einrastet, wodurch der Koppelarm (70) um den Schwenkpunkt (72) schwenkt, um einen effektiven Antriebsradius des Übertragungssegments (40) zu variieren und das Übertragungssegment (40) bei einer variablen Geschwindigkeit zu übertragen.

2. Vorrichtung (20) gemäß Anspruch 1, wobei die äußere Oberfläche (46) des Übertragungssegments (40) eine Oberflächenrauheit von wenigstens 3 Mikrometer definiert.

3. Vorrichtung (20) gemäß Anspruch 1, wobei die äußere Oberfläche (46) des Übertragungssegments (40) eine Plasmabeschichtung darauf umfasst.

4. Vorrichtung (20) gemäß Anspruch 3, wobei die äußere Oberfläche (46) des Übertragungssegments (40) eine Oberflächenrauheit von wenigstens 3 Mikrometer definiert.

5. Vorrichtung (20) gemäß Anspruch 2, wobei die äußere Oberfläche (46) eine Mehrzahl an Öffnungen definiert, durch welche ein Vakuum gezogen werden kann.

6. Vorrichtung (20) gemäß Anspruch 1, wobei die zweite Achse (64) des Antriebsrings (60) von der ersten Achse (44) des Übertragungssegments (40) um eine Entfernung von wenigstens 0,1 Zentimeter versetzt ist.

7. Vorrichtung (20) gemäß Anspruch 1, wobei das Kurbelende (78) des Koppelarms (70) eine Nut darin umfasst, welche zum gleitenden Einrasten in einen Nockenmitläufer (80) ausgebildet ist, der auf dem Übertragungssegment (40) angeordnet ist.

8. Vorrichtung (20) gemäß Anspruch 1, wobei das Kurbelende (78) des Koppelarms (70) ein Gleitelement (84) umfasst, welches schwenkbar mit dem Kurbelende (78) verbunden ist und welches zum gleitenden Einrasten in ein Schienenelement (86) ausgebildet ist, welches auf dem Übertragungssegment (40) angeordnet ist.

9. Vorrichtung (20) gemäß Anspruch 1, wobei eine erste Linie, die sich durch den Schwenkpunkt (72) und das Nockenende (76) des Koppelarms (70) erstreckt, und eine zweite Linie, die sich durch den Schwenkpunkt (72) und das Kurbelende (78) des Koppelarms (70) erstreckt, einen festen Winkel von 30 bis 180 Grad definieren.

10. Vorrichtung (20) gemäß Anspruch 1, wobei das Übertragungssegment (40) ausgebildet ist zum Aufrechterhalten einer im Wesentlichen konstanten ersten Oberflächengeschwindigkeit, wenn die diskreten Teile (26) empfangen werden, und einer im Wesentlichen konstanten zweiten Oberflächengeschwindigkeit, wenn die diskreten Teile (26) auf der zweiten Substratbahn (28) angebracht werden.

11. Vorrichtung (20) gemäß Anspruch 10, wobei das Übertragungssegment (40) zum Aufrechterhalten jeder der im Wesentlichen konstanten ersten Oberflächengeschwindigkeit und der im Wesentlichen konstanten zweiten Oberflächengeschwindigkeit für wenigstens 10 Grad Rotation des Übertragungssegments (40) ausgebildet ist.

12. Vorrichtung (20) gemäß Anspruch 10, wobei die erste Oberflächengeschwindigkeit des Übertragungssegments (40) im Wesentlichen gleich der ersten Geschwindigkeit der ersten Substratbahn (22) ist, und wobei die zweite Oberflächengeschwindigkeit des Übertragungssegments (40) im Wesentlichen gleich der zweiten Geschwindigkeit der zweiten Substratbahn (28) ist.

13. Vorrichtung (20) gemäß Anspruch 1, und ferner umfassend ein Drehmittel (110), welche mit dem Übertragungssegment (40) zum Rotieren der äußeren Oberfläche (46) des Übertragungssegments (40) verbunden sind, um die diskreten Teile (26) zu rotieren, bevor die Teile (26) auf der zweiten Substratbahn (28) angebracht werden.

14. Vorrichtung (20) gemäß einem der vorhergehenden Ansprüche, wobei die erste Substratbahn (22) eine verlängerte elastische Bahn ist und in diskrete verlängerte elastische Teile (26) getrennt wird, und wobei die zweite Substratbahn (28) eine Produktbahn aus verbundenen absorbierenden Wegwerfartikeln ist, wobei in Teil a)
eine Mehrzahl an Übertragungssegmenten (40) zum Rotieren um eine gemeinsame erste Achse (44) ausgebildet ist,
wobei in Teil c) eine Mehrzahl an Koppelarmen (70) bereitgestellt ist, wobei jeder schwenkbar mit dem Antriebsring (60) um einen jeweiligen Schwenkpunkt (72) verbunden ist,
wodurch die Koppelarme (70) um die Schwenkpunkte (72) geschwenkt werden, um einen effektiven Schwenkradius der Übertragungssegmente (40) unabhängig zu variieren und die Übertragungssegmente (40) bei einer variablen Geschwindigkeit zu rotieren.

15. Vorrichtung (20) gemäß Anspruch 14, wobei die äußere Oberfläche (46) des Übertragungssegments (40) eine Oberflächenrauheit von wenigstens 3 Mikrometern definiert, welche zum Aufrechterhalten der verlängerten elastischen Teile (26) in einem verlängerten Zustand ausgebildet ist.

16. Verfahren zum Durchtrennen eines ersten Substrats (22), welche sich mit einer ersten Geschwindigkeit bewegt, in diskrete Teile (26) und Anbringen der diskreten Teile (26) auf einem zweiten Substrat (28), welches sich mit einer zweiten Geschwindigkeit bewegt, wobei das Verfahren die folgenden Schritte umfasst:

a) Zuführen eines ersten Substrats (22) mit der ersten Geschwindigkeit und des zweiten Substrats (28) mit der zweiten Geschwindigkeit;

b) Durchtrennen des ersten Substrats (22) in die diskreten Teile (26);

c) Rotieren wenigstens eines Übertragungssegments (40) um eine erste Achse (44) mit einer variablen Geschwindigkeit; wobei der Schritt des Rotierens die folgenden Schritte umfasst:

d) Bereitstellen eines Antriebsrings (60), der um eine zweite Achse (64) rotierbar ist, welche zu der ersten Achse (44) versetzt ist, und Rotieren des Antriebsrings (60) um die zweite Achse (64);

e) Übertragen der diskreten Teile (26) auf eine äußere Oberfläche (46) des Übertragungssegments (40) während das Übertragungssegment (40) mit einer ersten Oberflächengeschwindigkeit rotiert; und

f) Anbringen der diskreten Teile (26) auf dem zweiten Substrat (28) während das Übertragungssegment (40) mit einer zweiten Oberflächengeschwindigkeit rotiert;

dadurch gekennzeichnet, dass
das erste Substrat (22) und das zweite Substrat (28) Bahnen sind, und dadurch dass
ein Koppelarm (70) bereitgestellt ist, der schwenkbar mit dem Antriebsring (60) um einen Schwenkpunkt (72) verbunden ist, der radial außerhalb der zweiten Achse (64) angeordnet ist, wobei der Koppelarm (70) ein Nockenende (76), welches zum Folgen eines vorbestimmten kurvenlinigen Weges ausgebildet ist, und ein Kurbelende (78) umfasst, welches gleitend mit dem Übertragungssegment (40) verbunden ist; und
dadurch, dass
durch Rotation des Antriebsrings (60) um die zweite Achse (64), das Nockenende (76) entlang des kurvenlinigen Weges geführt wird und das Kurbelende (78) gleitend in das Übertragungssegment (40) eingerastet ist, um den Koppelarm (70) um den Schwenkpunkt (72) zu schwenken, um einen effektiven Antriebsradius des Übertragungssegments (40) wahlweise zu variieren und das Übertragungssegment (40) mit der variablen Geschwindigkeit zu rotieren.

17. Verfahren gemäß Anspruch 16, wobei die erste Oberflächengeschwindigkeit der Übertragungssegmente (40) im Wesentlichen gleich der ersten Geschwindigkeit der ersten Substratbahn (22) und die zweite Oberflächengeschwindigkeit der Übertragungssegmente (40) im Wesentlichen gleich der zweiten Geschwindigkeit der zweiten Substratbahn (28) ist.

18. Verfahren gemäß Anspruch 16, wobei das Schwenken des Koppelarms (70) die erste Oberflächengeschwindigkeit des Übertragungssegments (40) im Wesentlichen konstant aufrechterhält, wenn die diskreten Teile (26) empfangen werden, und die zweite Oberflächengeschwindigkeit des Übertragungssegments (40) im Wesentlichen konstant aufrechterhält, wenn die diskreten Teile (26) auf der zweiten Substratbahn (40) angebracht werden.

19. Verfahren gemäß Anspruch 18, wobei die erste Oberflächengeschwindigkeit und die zweite Oberflächengeschwindigkeit für wenigstens 10 Grad Rotation des Übertragungssegments (40) im Wesentlichen aufrechterhalten werden.

20. Verfahren gemäß Anspruch 16, wobei die erste

Oberflächengeschwindigkeit des Übertragungssegments (40) geringer ist als die zweite Oberflächengeschwindigkeit des Übertragungssegments (40), so dass die diskreten Teile (26) auf der zweiten Substratbahn (28) in einem beabstandeten Verhältnis angebracht werden.

21. Verfahren gemäß Anspruch 20, wobei die erste Oberflächengeschwindigkeit und die zweite Oberflächengeschwindigkeit ein Geschwindigkeitsverhältnis von 0,1:1 bis 0,99:1 aufweisen.

22. Verfahren gemäß Anspruch 16, wobei die zweite Achse (64) des Antriebsrings (60) von der ersten Achse (44) des Übertragungssegment (40) um eine Entfernung von wenigstens 0,1 Zentimetern versetzt ist.

23. Verfahren gemäß Anspruch 16, wobei das Kurbelende (78) des Koppelarms (70) eine Nut darin umfasst, welche gleitend in einen Nockenmitläufer (80) einrastet, der auf dem Übertragungssegment (40) angeordnet ist, wenn der Antriebsring (60) rotiert wird.

24. Verfahren gemäß Anspruch 16, wobei das Kurbelende (78) des Koppelarms (70) ein Gleitelement umfasst, welches um das Kurbelende (78) schwenkt und gleitend in ein Schienenelement (86) einrastet, welches auf dem Übertragungssegment (40) angeordnet ist, wenn der Antriebsring (60) rotiert wird.

25. Verfahren gemäß Anspruch 16, wobei der Schritt des Rotierens des Antriebsrings (60) den Koppelarm (70) um den Schwenkpunkt (72) um wenigstens 5 Grad schwenkt.

26. Verfahren gemäß Anspruch 16, und ferner umfassend das Rotieren der äußeren Oberfläche (46) des Übertragungssegments (40) zum Rotieren der diskreten Teile (26) bevor die Teile (26) auf der zweiten Substratbahn (28) angebracht werden.

27. Verfahren gemäß Anspruch 26, wobei die diskreten Teile (26) um 1 bis 90 Grad rotiert werden bevor sie auf der zweiten Substratbahn (28) angebracht werden.

28. Verfahren gemäß einem der Ansprüche 16 bis 27, wobei die erste Substratbahn (22) eine verlängerte elastische Bahn ist und in diskrete elastische Teile (26) durchtrennt werden, und wobei die verlängerten elastischen Teile (26) in einem beabstandeten Verhältnis auf der zweiten Substratbahn (28) angebracht werden, wobei die zweite Substratbahn (28) eine Produktbahn aus verbundenen absorbierenden Wegwerfartikeln ist, wobei in Schritt

c) eine Mehrzahl an Übertragungssegmenten (40) um eine gemeinsame erste Achse (44) rotiert wird; wobei in Schritt

ii) eine Mehrzahl an Koppelarmen (70) bereitgestellt ist, wobei jeder schwenkbar mit dem Antriebsring (60) um einen jeweiligen Schwenkpunkt (72) verbunden ist, wobei jeder der Koppelarme (70) um den jeweiligen Schwenkpunkt (72) verschwenkt wird, um einen effektiven Antriebsradius jedes der Übertragungssegmente (40) unabhängig zu variieren und die Übertragungssegmente (40) mit der variablen Geschwindigkeit zu rotieren; wobei in Schritt

d) jeder der diskreten verlängerten elastischen Teile (26) auf eine äußere Oberfläche (46) des jeweiligen Übertragungssegments (40) übertragen wird, während das jeweilige Übertragungssegment (40) mit einer ersten Oberflächengeschwindigkeit rotiert, welche im Wesentlichen gleich der ersten Geschwindigkeit der verlängerten elastischen Bahn ist; und wobei in Schritt

e) die zweite Oberflächengeschwindigkeit im Wesentlichen gleich der zweiten Geschwindigkeit der Produktbahn (28) ist.

29. Verfahren gemäß Anspruch 28, und ferner umfassend den Schritt des Verlängerns der elastischen Bahn um wenigstens 150 Prozent.

30. Verfahren gemäß Anspruch 28, und ferner umfassend den Schritt des Aufrechterhaltens der diskreten verlängerten elastischen Teile (26) mit einer Verlängerung von wenigstens 125 Prozent bis die verlängerten elastischen Teile (26) auf der Produktbahn (28) angebracht werden.

31. Verfahren gemäß Anspruch 30, wobei der Schritt des Aufrechterhaltens der diskreten verlängerten elastischen Teile (26) mit der Verlängerung ferner den Schritt des Auswählens der äußeren Oberfläche (46) der Übertragungssegmente (40) umfasst, um eine Oberflächenrauheit von wenigstens 3 Mikrometer zu definieren.

32. Verfahren gemäß Anspruch 1, wobei der Schritt des Aufrechterhaltens der diskreten verlängerten elastischen Teile (26) mit der Verlängerung ferner den Schritt des Ziehens eines Vakuums durch eine Mehrzahl an Öffnungen, welche in der äußeren Oberfläche (46) jedes Übertragungssegments (40) definiert sind.

33. Verfahren gemäß Anspruch 28, und ferner umfassend das Rotieren der äußeren Oberfläche (46) des Übertragungssegments (40), um die diskreten verlängerten elastischen Teile (26) zu rotieren bevor die Teile (26) auf der Produktbahn (28) angebracht werden.

34. Verfahren gemäß Anspruch 33, wobei die diskreten verlängerten elastischen Teile (26) um 1 bis 90 Grad rotiert werden, bevor sie auf der Produktbahn (28) angebracht werden.

Revendications

1. Appareil (20) pour sectionner un premier substrat (22), se déplaçant à une première vitesse, en pièces discrètes (26) et pour appliquer ces pièces discrètes (26) sur un second substrat (28) se déplaçant à une seconde vitesse, ledit appareil comprenant :

   a) au moins un segment de transfert (40) qui est configuré pour tourner autour d'un premier axe (44) et qui inclut une surface extérieure (46) qui est configurée pour recevoir lesdites pièces discrètes (26) et appliquer lesdites pièces discrètes (26) sur ledit second substrat (28) ;
   b) un anneau d'entraînement (60) qui est configuré pour tourner autour d'un second axe (64) décalé par rapport au premier axe (44) dudit segment de transfert (40) ;
   c) un moyen d'entraînement pour faire tourner ledit anneau d'entraînement (60) autour dudit second axe (64) ;

   caractérisé en ce que ;

   - ledit premier substrat (22) et ledit second substrat (28) sont des nappes, et
   - ledit appareil (20) comprend en outre au moins un bras de couplage (70) connecté de manière pivotante audit anneau d'entraînement (60) autour d'un point de pivot (72) situé radialement à l'extérieur par rapport audit second axe (64), ledit bras de couplage (70) incluant une extrémité formant came (76) qui est configurée pour suivre un chemin curviligne prédéterminé, et une extrémité formant manivelle (78) qui est connectée coulissante audit segment de transfert (40) ; et,
   - tandis que l'anneau d'entraînement (60) est mû en rotation, ladite extrémité formant came (76) dudit bras de couplage (70) est guidée le long de ce chemin curviligne et ladite extrémité formant manivelle (78) dudit bras de couplage (70) vient en prise coulissante avec ledit segment de transfert (40) faisant ainsi pivoter ledit bras de couplage (70) autour dudit point de pivot (72) pour faire varier un rayon d'entraînement efficace dudit segment de transfert (40) et faire tourner ledit segment de transfert (40) à une vitesse variable.

2. Appareil (20) selon la revendication 1, dans lequel ladite surface extérieure (46) dudit segment de transfert (40) définit une rugosité de surface d'au moins 3 micromètres.

3. Appareil (20) selon la revendication 1, dans lequel ladite surface extérieure (46) dudit segment de transfert (40) comporte un revêtement au plasma.

4. Appareil (20) selon la revendication 3, dans lequel ladite surface extérieure (46) dudit segment de transfert (40) définit une rugosité de surface d'au moins 3 micromètres.

5. Appareil (20) selon la revendication 2, dans lequel ladite surface extérieure (46) définit une pluralité d'orifices à travers lesquels un vide peut être tiré.

6. Appareil (20) selon la revendication 1, dans lequel ledit second axe (64) dudit anneau d'entraînement (60) est décalé par rapport audit premier axe (44) dudit segment de transfert (40) d'une distance d'au moins 0,1 centimètre.

7. Appareil (20) selon la revendication 1, dans lequel ladite extrémité formant manivelle (78) dudit bras de couplage (70) inclut, en son sein, une rainure qui est configurée pour venir en prise coulissante avec un suiveur de came (80) situé sur ledit segment de transfert (40).

8. Appareil (20) selon la revendication 1, dans lequel ladite extrémité formant manivelle (78) dudit bras de couplage (70) inclut un coulisseau (84), connecté de manière pivotante à ladite extrémité formant manivelle (78) et configuré pour venir en prise coulissante avec un élément formant rail (86) situé sur ledit segment de transfert (40).

9. Appareil (20) selon la revendication 1, dans lequel une première ligne passant par ledit point de pivot (72) et ladite extrémité formant came (76) dudit bras de couplage (70) et une seconde ligne passant par ledit point de pivot (72) et ladite extrémité formant manivelle (78) dudit bras de couplage (70) définissent un angle fixe allant de 30 à 180 degrés.

10. Appareil (20) selon la revendication 1, dans lequel ledit segment de transfert (40) est configuré pour maintenir une première vitesse superficielle sensiblement constante tandis que lesdites pièces dis-

crètes (26) sont reçues, et une seconde vitesse superficielle sensiblement constante tandis que lesdites pièces discrètes (26) sont appliquées à ladite seconde nappe formant substrat (28).

11. Appareil (20) selon la revendication 10, dans lequel ledit segment de transfert (40) est configuré pour maintenir chacune de ces première et seconde vitesses superficielles sensiblement constantes pendant au moins 10 degrés de rotation dudit segment de transfert (40).

12. Appareil (20) selon la revendication 10, dans lequel ladite première vitesse superficielle dudit segment de transfert (40) est sensiblement égale à ladite première vitesse de ladite première nappe formant substrat (22) et ladite seconde vitesse superficielle dudit segment de transfert (40) est sensiblement égale à ladite seconde vitesse de ladite seconde nappe formant substrat (28).

13. Appareil (20) selon la revendication 1, comprenant en outre un moyen de mise en rotation (110) qui est connecté audit segment de transfert (40) pour faire tourner ladite surface extérieure (46) dudit segment de transfert (40) afin de faire tourner lesdites pièces discrètes (26) avant que lesdites pièces (26) ne soient appliquées à ladite seconde nappe formant substrat (28).

14. Appareil (20) selon l'une quelconque des revendications précédentes, dans lequel la première nappe formant substrat (22) est une nappe élastique allongée et est sectionnée en pièces discrètes élastiques allongées (26) et la seconde nappe formant substrat (28) est une nappe de produits constituée d'articles absorbants jetables interconnectés, appareil qui comprend :

> dans la partie a) une pluralité de segments de transfert (40) configurés pour tourner autour d'un premier axe commun (44)
> une pluralité de bras de couplage (70), dont chacun est connecté de manière pivotante audit anneau d'entraînement (60) autour d'un point pivot respectif (72),
> grâce à quoi lesdits bras de couplage (70) pivotent autour desdits points de pivot (72) pour faire varier de manière indépendante un rayon d'entraînement efficace desdits segments de transfert (40) et pour faire tourner lesdits segments de transfert (40) à une vitesse variable.

15. Appareil (20) selon la revendication 14, dans lequel ladite surface extérieure (46) desdits segments de transfert (40) définit une rugosité de surface d'au moins 3 micromètres qui est configurée pour maintenir lesdites pièces élastiques allongées (26) dans un état allongé.

16. Méthode pour sectionner un premier substrat (22) se déplaçant à une première vitesse en pièces discrètes (26) et appliquer lesdites pièces discrètes (26) sur un second substrat (28) se déplaçant à une seconde vitesse, ladite méthode comprenant les étapes de :

> a) fourniture dudit premier substrat (22) à ladite première vitesse et dudit second substrat (28) à ladite seconde vitesse ;
> b) sectionnement dudit premier substrat (22) en lesdites pièces discrètes (26) ;
> c) rotation d'au moins un segment de transfert (40) autour d'un premier axe (44) à une vitesse variable ; méthode dans laquelle cette étape de rotation inclut les étapes de :
> d) fourniture d'un anneau d'entraînement (60) qui peut tourner autour d'un second axe (64), décalé dudit premier axe (44), et rotation dudit anneau d'entraînement (60) autour dudit second axe (64) ;
> e) transfert desdites pièces discrètes (26) sur une surface extérieure (46) dudit segment de transfert (40) alors que ledit segment de transfert (40) est en train de tourner à une première vitesse superficielle ; et
> f) application desdites pièces discrètes (26) sur ledit second substrat (28) alors que ledit segment de transfert (40) est en train de tourner à une seconde vitesse superficielle ;
>
> **caractérisée en ce que** :

- ledit premier substrat (22) et ledit second substrat (28) sont des nappes, et **en ce que**
- un bras de couplage (70) est fourni qui est connecté de manière pivotante audit anneau d'entraînement (60) autour d'un point de pivot (72) situé à l'extérieur radialement par rapport audit second axe (64), méthode dans laquelle ledit bras de couplage (70) inclut une extrémité formant came (76) qui est configurée pour suivre un chemin curviligne prédéterminé et une extrémité formant manivelle (78) qui est connectée coulissante audit segment de transfert (40) ; et
- **en ce que**, en faisant tourner ledit anneau d'entraînement (60) autour dudit second axe (64), ladite extrémité formant came (76) est guidée le long dudit chemin curviligne et ladite extrémité formant manivelle (78) est en prise coulissante avec ledit segment de transfert (40) pour faire pivoter ledit bras de couplage (70) autour dudit point de pivot (72) pour faire varier sélectivement un rayon d'entraînement efficace dudit segment de transfert (40) et faire tourner le-

dit segment de transfert (40) à ladite vitesse variable.

17. Méthode selon la revendication 16, dans laquelle ladite première vitesse superficielle desdits segments de transfert (40) est sensiblement égale à ladite première vitesse de ladite première nappe formant substrat (22) et ladite seconde vitesse superficielle desdits segments de transfert (40) est sensiblement égale à ladite seconde vitesse de ladite seconde nappe formant substrat (28).

18. Méthode selon la revendication 16, dans laquelle ledit pivotement dudit bras de couplage (70) maintient, d'une part, ladite première vitesse superficielle dudit segment de transfert (40) sensiblement constante tandis que lesdites pièces discrètes (26) sont reçues et, d'autre part, ladite seconde vitesse superficielle desdits segments de transfert (40) sensiblement constante tandis que les pièces discrètes (26) sont appliquées à ladite seconde nappe formant substrat (28).

19. Méthode selon la revendication 18, dans laquelle ladite première vitesse superficielle et ladite seconde vitesse superficielle sont maintenues sensiblement constantes pendant au moins 10 degrés de rotation dudit segment de transfert (40).

20. Méthode selon la revendication 16, dans laquelle ladite première vitesse superficielle dudit segment de transfert (40) est moindre que ladite seconde vitesse dudit segment de transfert (40) de telle sorte que lesdites pièces discrètes (26) sont appliquées à ladite seconde nappe formant substrat (28) de manière espacée.

21. Méthode selon la revendication 20, dans laquelle ladite première vitesse superficielle et ladite seconde vitesse superficielle définissent un rapport de vitesse allant de 0,1 : 1 à 0,99 : 1.

22. Méthode selon la revendication 16, dans laquelle ledit second axe (64) dudit anneau d'entraînement (60) est décalé dudit premier axe (44) dudit segment de transfert (40) d'une distance d'au moins 0,1 centimètre.

23. Méthode selon la revendication 16, dans laquelle ladite extrémité formant manivelle (78) dudit bras de couplage (70) inclut, en son sein, une rainure qui vient en prise coulissante avec un suiveur de came (80) situé sur ledit segment de transfert (40) lorsque ledit anneau d'entraînement (60) est mû en rotation.

24. Méthode selon la revendication 16, dans laquelle ladite extrémité formant manivelle (78) dudit bras de couplage (70) inclut un coulisseau qui pivote autour de ladite extrémité formant manivelle (78) et vient en prise coulissante avec un élément formant rail (86) situé sur ledit segment de transfert (40), lorsque ledit anneau d'entraînement (60) est mû en rotation.

25. Méthode selon la revendication 16, dans laquelle ladite étape de rotation dudit anneau d'entraînement (60) fait pivoter ledit bras de couplage (70) autour dudit point de pivot (72) d'au moins 5 degrés.

26. Méthode selon la revendication 16, comprenant en outre la rotation de ladite surface extérieure (46) dudit segment de transfert (40) pour faire tourner lesdites pièces discrètes (26), avant que lesdites pièces (26) ne soient appliquées à ladite seconde nappe formant substrat (28).

27. Méthode selon la revendication 26, dans laquelle lesdites pièces discrètes (26) sont tournées de 1 à 90 degrés avant d'être appliquées à ladite seconde nappe formant substrat (28).

28. Méthode selon l'une quelconque des revendications 16 à 27, dans laquelle ladite première nappe formant substrat (22) est une nappe élastique allongée et est découpée en pièces discrètes élastiques allongées (26), et dans laquelle lesdites pièces élastiques allongées (26) sont appliquées de manière espacée sur la seconde nappe formant substrat (28), la seconde nappe formant substrat (28) étant une nappe d'articles absorbants jetables interconnectés, méthode dans laquelle :

> à l'étape c)une pluralité de segments de transfert (40) sont mus en rotation autour d'un premier axe commun (44) ;où, dans l'étape
>
> > ii) une pluralité de bras de couplage (70) sont fournis, chacun étant connecté de manière pivotante audit anneau d'entraînement (60) autour d'un point de pivot respectif (72) grâce à quoi chacun desdits bras de couplage (70) est pivoté autour desdits points de pivot respectifs (72) pour faire varier indépendamment un rayon d'entraînement efficace de chacun desdits segments de transfert (40) et faire tourner lesdits segments de transfert (40) à ladite vitesse variable ;
>
> dans l'étape d), chacune desdites pièces discrètes élastiques allongées (26) est transférée sur la surface extérieure (46) dudit segment de transfert respectif (40) tandis que ledit segment de transfert respectif (40) est en train de tourner à une première vitesse superficielle qui est sensiblement égale à ladite première vites-

se de ladite nappe élastique allongée ; dans l'étape e), ladite seconde vitesse superficielle est sensiblement égale à ladite seconde vitesse de ladite nappe de produits (28).

29. Méthode selon la revendication 28, comprenant en outre l'étape d'allongement de ladite nappe élastique d'au moins 150 pour cent.

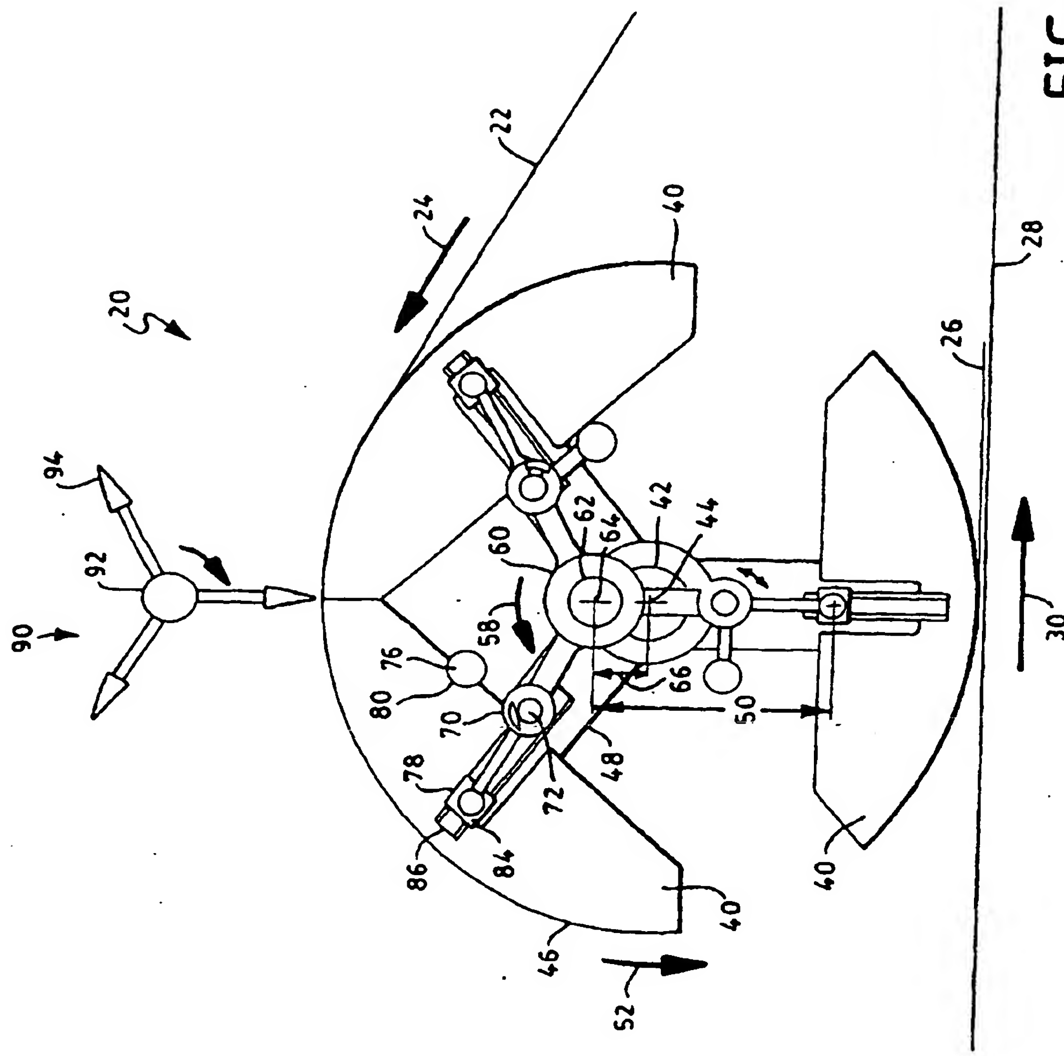
30. Méthode selon la revendication 28, incluant en outre l'étape de maintien desdites pièces discrètes élastiques allongées (26) à un allongement d'au moins 125 pour cent jusqu'à ce que lesdites pièces élastiques allongées (26) soient appliquées à ladite nappe de produits (28).

31. Méthode selon la revendication 30, dans laquelle ladite étape de maintien desdites pièces discrètes élastiques allongées (26) audit allongement inclut en outre l'étape de sélection de ladite surface extérieure (46) desdits segments de transfert (40) pour définir une rugosité de surface d'au moins 3 micromètres.

32. Méthode selon la revendication 31, dans laquelle ladite étape de maintien desdites pièces discrètes élastiques allongées (26) audit allongement inclut en outre l'étape d'application d'un vide à travers une pluralité d'orifices définis dans ladite surface extérieure (46) de chacun desdits segments de transfert (40).

33. Méthode selon la revendication 28, comprenant en outre la rotation de ladite surface extérieure (46) dudit segment de transfert (40) pour faire tourner lesdites pièces discrètes élastiques allongées (26) avant que lesdites pièces (26) ne soient appliquées à ladite nappe de produits (28).

34. Méthode selon la revendication 33, dans laquelle lesdites pièces discrètes élastiques allongées (26) sont tournées de 1 à 90 degrés avant d'être appliquées à ladite nappe de produits (28).


20
22
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92
94

FIG. 1

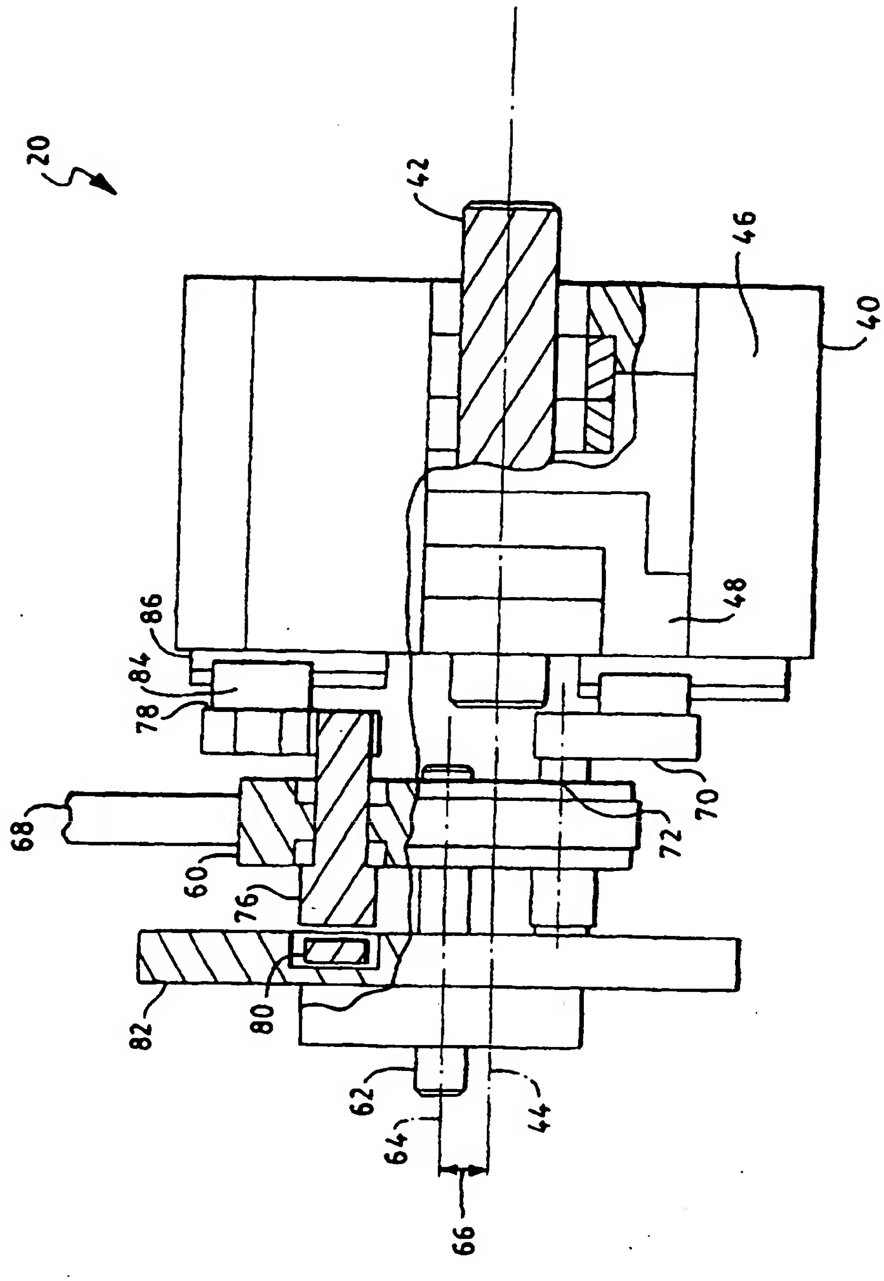

FIG. 2

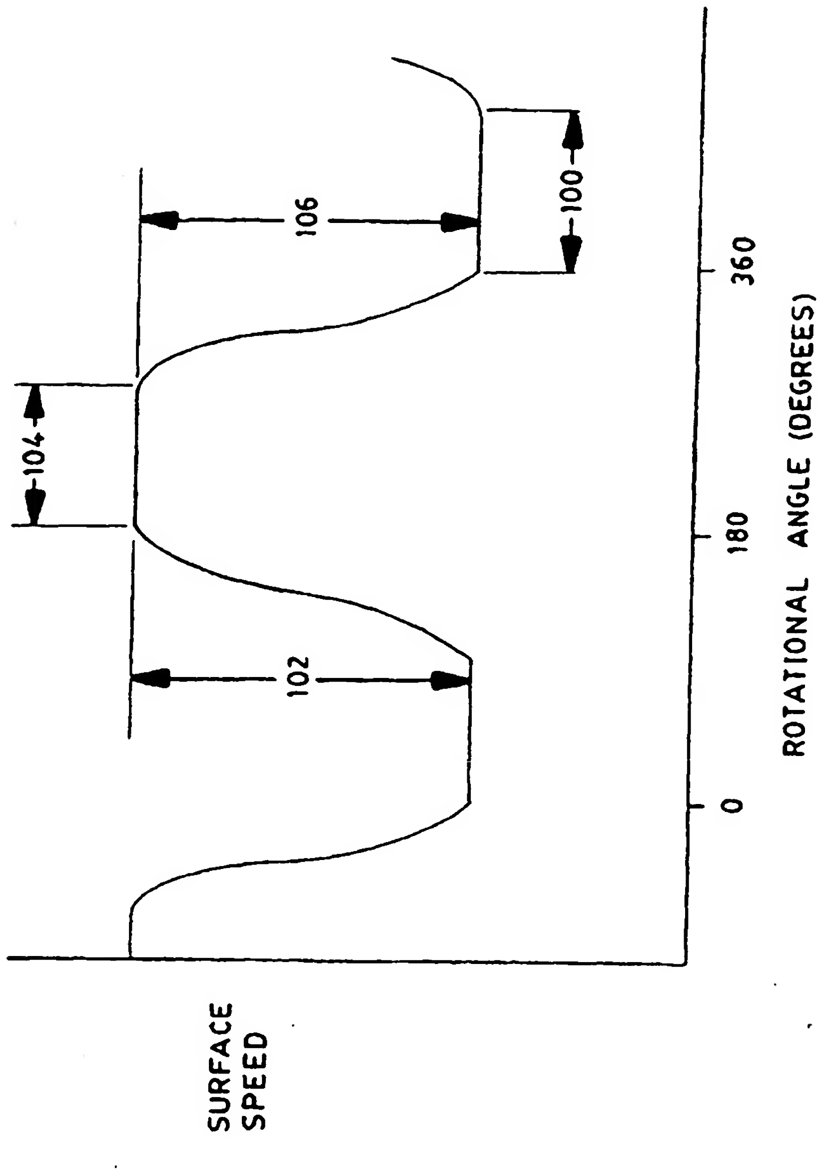
SURFACE SPEED
ROTATIONAL ANGLE (DEGREES)
0
180
360
100
102
104
106

FIG. 3

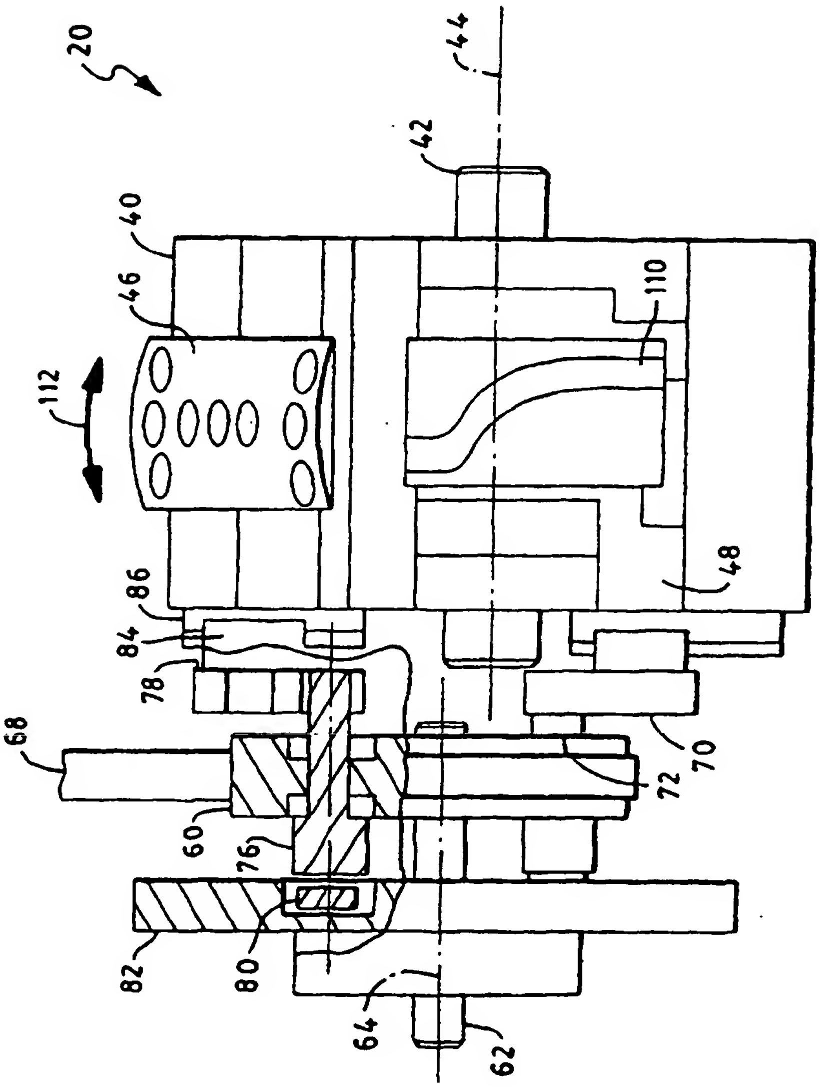

FIG. 4